Appendix H
BAY MANAGEMENT STUDY
DATA AND INFORMATION NEEDS

INTRODUCTION

Limitations in scientific data about the nearshore are often cited as a major constraint in moving forward with improved nearshore management. This data and information needs assessment was carried out to more fully examine this sentiment so that informed recommendations could be made. More specifically, the goals in carrying out this data and information needs assessment are:

1) determine the range of nearshore data and information needed for bay management
2) identify which data currently exists and where it is located
3) identify major limitations in the data and information
4) assess the current state of data availability and sharing
5) recommend specific steps to improving the availability of nearshore data and information

We are interested in learning what nearshore data and information are available, where such data can be located, how it is shared and exchanged and what limitations exist in the data and in information flow. To do this we looked at representative types of data and the most common locations for this data; we were not comprehensive and we did not attempt to provide a complete data inventory. This report is not meant to be a guide for someone who wants to find nearshore data. Rather, the information gathered in this report is intended to support solid recommendations about data needs for bay management.

The terms 'data' and 'information' in this report refer to both raw data and numbers and to analyzed or processed data that provides information and a greater understanding about a topic. Data and information can be in many forms including tables and charts, text in reports, in-depth analyses and assessments, and Geographic Information System (GIS) layers to create maps.

Methods:

This assessment was carried out by two Department of Marine Resources staff and one State Planning Office staff. We reviewed major publications and websites regarding nearshore data to come up with the range of data needed for bay management (see references). In order to identify who creates and maintains data and the limitations of that data, we drew heavily upon staff knowledge, review of other agencies' and organizations' websites, and targeted phone calls. While we wanted to identify who maintains the needed data, we did not attempt to carry out a complete nearshore data inventory for the State of Maine, and we are likely to have neglected some organizations' data (especially that collected by university researchers). In order to develop the Findings section, we noted our own observations in doing this study, referred to results of the two bay management pilot projects, spoke with several outside individuals and cited three GIS needs assessment studies, including a Maine Marine GIS Needs Assessment completed in May 2006.

Organization:

This report is organized into three major sections: Current Data Availability and Exchange; Findings (based on assessment of data availability and exchange); and Recommendations (optimal endpoints and how to get there).

SECTION 1: CURRENT DATA AVAILABILITY AND EXCHANGE

Because 'bay management' actually refers to a suite of activities ranging from working on a specific issue in a bay (e.g. regional water access planning) to engaging bay communities (e.g. regional visioning process) to multi-resource area management, the type of data (and the resolution and scale of that data) needed for bay management will vary accordingly. While it is impossible to know every type of data that might be needed, it is, however, possible to create a list of the types of data that would be useful for many kinds of bay management projects.

The following list of data could be used to characterize a bay. A comprehensive characterization would be a complex undertaking and would involve new data collection, synthesis or processing of existing data, and knowledgeable application. A smaller subset of the following data could be used to more generally describe an embayment and provide baseline data. This type of work requires compiling existing data and collecting priority new data, but, with some funding and expertise, could be a potential starting point for many bay management efforts. Finally, a given bay management project may only need one or two of these data types to inform an issue or problem at hand.

Nearshore Data and Information Relevant to Bay Management

This list of data has been divided into three categories: Physical/Chemical Information, Biological Information, and Social Information. The left hand column specifies the specific type of data, and the right hand column provides information about who primarily collects that data (not a comprehensive list), if it is available as a GIS layer, and what limitations exist (e.g., with scale, resolution, geographic extent, availability).

Physical/Chemical Information

Data Type		Data Availability
Bay specific circulation patterns and relation to GOM	**Who has data?**	Researchers at UMO, USGS, and Texas A&M have each studied different bays
	GIS layers available?	Yes, for some
	Limitations?	Circulation data is only available for Cobscook, Casco and Penobscot bays. There is more limited flow/hydrology data for other areas such as Stonington, Blue Hill Bay, Sheepscot, Damariscotta and lower Kennebec.
Tides	**Who has data?**	NOAA NOS, GOMOOS, UMO
	GIS layers available?	No
	Limitations?	Tide predictions are often quite different than real time data. Locations for tide predictions and measurements are limited; local knowledge fills in where predictions lack.

Physical/Chemical Information, continued

Data Type		Data Availability
Nutrients, Temperature, and Salinity	**Who has data?**	GOMOOS; DMR; EPA National Coastal Assessment; Local groups such as Friends of Casco Bay
	GIS layers available?	Yes for some (e.g. GoMOOS has satellite data) but not for most.
	Limitations?	Local groups often collect this type of water quality data, but there is no one place where that data is stored or referenced, so it is not clear where there are gaps along the coast.
Bathymetry	**Who has data?**	MGS (10m contours); NOAA soundings
	GIS layers available?	Yes
	Limitations?	Nearshore data is variable in quality and all this data is below MLW.
Benthic substrate	**Who has data?**	MGS (primary source); UMO and DMR to lesser extent
	GIS layers available?	Yes
	Limitations?	Different levels of resolution depending on where you are on the coast. There is very little CMGE information below mean low tide. UMO data is mostly deep water and most of coast is inferred.
Geology	**Who has data?**	MGS has inner continental shelf surficial geology data, but bedrock geology hasn't been determined.
	GIS layers available?	No
	Limitations?	Doesn't seem to exist
Coastal air quality/ atmospheric deposition	**Who has data?**	DEP (some stations on coast) National Atmospheric Deposition Program (2 coastal sites)
	GIS layers available?	Yes (location of monitoring sites)
	Limitations?	Limited locations available
Weather	**Who has data?**	NOAA; GOMOOS (wind, temperature); DMR – Boothbay weather and sea conditions
	GIS layers available?	yes? (wind speed and direction for GOM)
	Limitations?	Limited locations
Climate Change	**Who has data?**	UMO and Bigelow
	GIS layers available?	
	Limitations?	Not bay specific

Biological Information

Data Type		Data Availability
Species specific data: abundance, location, condition, requirements for all species of commercial, recreational, and ecological significance (phytoplank-ton, macrophytes, invertebrates, fish, birds, marine mammals)	**Who has data?**	DMR – commercial and noncommercial fish (e.g. inshore trawl survey); rockweed; eelgrass; horseshoe crabs IFW – Bald eagle nest sites; piping plover/least tern nest sites; seabird nesting islands USFWS – Atlantic salmon; seabird counts on islands in Maine Coastal Islands NWR; wintering waterfowl surveys; Darling Center/UMO – marine mammals, invertebrate taxonomy and ecology, deep sea biology, phytoplankton Allied Whale/COA – marine mammals Audubon - puffins Bigelow – invertebrates including lobster, phytoplankton incl. red and brown tides DEP – contaminants in some marine tissues (e.g. mussels, lobsters and cormorants) GoMOOS – chlorophyll/sunlight data to estimate phytoplankton biomass GOM Ocean Data Partnership – fish abundance and distribution for GOM GMRI – Herring acoustic survey, shrimp survey, lobster diet study, cod-tagging
	GIS layers available?	Some
	Limitations?	Much of the information available about specific species is general; rarely is there data available about the distribution, condition and location of species in a specific area.
Habitat data: location and condition of coastal, intertidal, subtidal and open water habitats	**Who has data?**	MGS - CMGE maps show basic habitats for intertidal areas; beach profiles; bluffs, sand dune photos, inner continental shelf IFW – salt marsh habitat mapping in some areas; tidal waterfowl/wading bird habitats; Roseate tern essential habitat DMR – eelgrass; marine worm habitat Wells Reserve – Salt marsh habitats and communities; Reserve habitat values for fish, shellfish and birds; Salt marsh degradation and restoration GOM Ocean Data Partnership – benthic and pelagic seascapes Specific studies done by researchers. Gulf of Maine Council on the Marine Environment – salt marsh restoration, riparian buffers, seafloor mapping
	GIS layers available?	Some
	Limitations?	Limited habitat data exist for specific coastal regions. No central repository for the specific studies that have been done by researchers or local groups.

Biological Information, continued

Data Type		Data Availability
Species interactions/ communities; Ecosystem components and functions	**Who has data?**	Research institutes (e.g., Bigelow, Darling Center/UMO, UNH)
	GIS layers available?	No
	Limitations?	This research appears to be opportunistic and not usually location-specific. We generally lack good information about species interactions, communities and ecosystem functions, especially at a bay-scale.

Social and Human Use Information

Data Type		Data Availability
Human population	**Who has data?**	US Census Bureau; SPO
	GIS layers available?	Yes
	Limitations?	Organized by town and county, not by ecoregions
Residential data (type & distribution; development trends)	**Who has data?**	Bob Faunce (independent consultant) time series of development using USGS maps for 14 midcoast towns done for ME DOT and with SVCA GIS support center
	GIS layers available?	
	Limitations?	Limited in geographic extent; not publicly available?
Water access (commercial and recreational): location, conflicts	**Who has data?**	Island Institute (in progress); DOT/DMR port inventory; DEP – dock permits
	GIS layers available?	Yes
	Limitations?	The Island Institute inventory is more detailed than anything done before, but the private access points will most likely be kept confidential and only the public access made available.
Fisheries – for each resource used: where, frequency and intensity, benefits, impacts, threats to the resource	**Who has data?**	DMR (landings data for 32 species; research projects); shellfish growing area classifications; lobster zones, pounds and dealers NMFS Atlantic Salmon Commission GOMOOS – Northern shrimp catch
	GIS layers available?	Yes: Drag areas; Lobster zones. Not much else
	Limitations?	We don't have enough data about fisheries use. Landings data is not available at a bay level. Data is for the port of sale, not for where the resource is harvested. Confidentiality of some data limits its use.

Social and Human Use Information, continued

Data Type		Data Availability
Aquaculture – locations, impacts, benefits	**Who has data?**	DMR (compliance data for finfish sites) DEP (shellfish sites)
	GIS layers available?	Yes
	Limitations?	DEP's data is not analyzed and may be difficult to interpret. DMR's data is patchy and not interpreted. Confidentiality of some data limits its use.
Recreation – where, what, intensity, trends	**Who has data?**	DMR – recreational fishing; MITA – island use; MASKGI; Sea Grant – kayaking; Maine Port Authority – dock/marina locations; Maine Marine Trade Association – clean marinas list
	GIS layers available?	Unlikely
	Limitations?	Scattered data; Data about many types of recreational uses and issues is lacking.
Marine transport	**Who has data?**	Individual port records; Maine Port Authority website; DOT (Office of freight transport); Coast Guard
	GIS layers available?	No?
	Limitations?	
Dredging and spoils locations	**Who has data?**	US Army Corps of Engineers; DEP
	GIS layers available?	Some (limited sites)
	Limitations?	Old data in paper files, making access difficult.
Energy projects (tidal, wind, hydro?)	**Who has data?**	Private industry; SPO
	GIS layers available?	No
	Limitations?	Emerging use – limited information available
Water quality & Pollution (point and nonpoint) amounts and impacts	**Who has data?**	DEP – point source, OBDs, Gulf Watch (mussel contaminants), hazardous and oil spills, water quality data for Atlantic salmon rivers, pumpout locations; DMR – human health impacts, mostly bacteria; EPA – Nat'l Coastal Assessment (toxics and nutrients); SPO/DMR – Healthy Beaches program; MGS – Landslide hazards; Wells Reserve – estuarine water quality; Gulf of Maine Council on the Marine Environment; Individual organizations (e.g. Friends of Casco Bay)
	GIS layers available?	Yes for most this data

Social and Human Use Information, continued

Data Type		Data Availability
	Limitations?	Data collection is not systematic; it occurs in areas where money, resources and interest emerge. Little to no analysis of how specific land uses/NPS pollution impacts coastal water quality, habitats and organisms.
Economic benefits tied to use of nearshore environment	**Who has data?**	DMR landings values; USM natural resource economist Charles Colgan (Ocean Economics Project?)
	GIS layers available?	No
	Limitations?	Very limited information and what exists is not bay specific
Cumulative impacts of multiple uses	**Who has data?**	No known studies
	GIS layers available?	No
	Limitations?	Virtually non-existent
Conserved or protected areas (locations and types)	**Who has data?**	MCHT (provides master database for individual land trusts); NPS, USFWS – federal protected lands; BPL, IFW – state protected lands (SPO has a conserved lands GIS layer that displays state and some federal and private lands) Municipalities – town lands; NOAA survey of marine managed areas (in progress - ME data not displayed yet); IFW - Beginning with Habitat
	GIS layers available?	Some. For example, MEGIS – conserved lands layer (state and national lands) and BwH data layers
	Limitations?	MCHT has a conserved lands registry for all coastal lands owned or protected by individual land trusts but this data is not available to others. Land trusts can access their own information through a website for the registry. Some conserved areas (i.e. some lands/easements owned by land trusts) may be confidential or proprietary and not available for others to use. BwH focus areas are not protected, but are presented to towns as valued areas
Marine Archeology	**Who has data?**	Darling Marine Center Maine Historic Preservation Commission
	GIS layers available?	?
	Limitations?	MHPC compiles information about archaeological sites, but I'm not certain if they look at marine areas

Social and Human Use Information, continued

Data Type		Data Availability
Stewardship activities; Monitoring activities	**Who has data?**	DMR/SPO/Cooperative Extension – Partners in Monitoring; GOMC; and Individual groups
	GIS layers available?	Unlikely
	Limitations?	Data collection is not systematic; it occurs in areas where money, resources and interest emerge. Some groups consistently collected data over time, while others fizzle out, which means data quality varies by place.
Shoreland zoning	**Who has data?**	DEP and municipalities
	GIS layers available?	No?
	Limitations?	Information on paper in DEP files or town offices.

Bay Specific Data

There have been efforts in some bays to compile existing data about that bay, collect new data, and analyze the data to provide more complete understanding in that area. Some examples are:

Cobscook Bay - The Cobscook Bay Resource Center carries out water quality data collection and community-based research (e.g., Cobscook Drift study for flow patterns). They also put out a report on the Cobscook Bay sea scallop fishery, and have links on their website to the TNC book titled: "Ecosystem Modeling in Cobscook Bay" and TNC has a bibliography of studies in the Cobscook Bay region.

Taunton Bay – The Friends of Taunton Bay and The Department of Marine Resources have completed studies and analysis regarding a wide range of environmental and social factors.

Penobscot Bay – The Island Institute administers the Penobscot Bay Marine Resources Collaborative (but current links on their website don't work). Research includes phytoplankton communities, surficial mapping, intertidal habitat definition and mapping, circulation patterns, intertidal lobsters, seafloor geology, and bathymetry. The East Penobscot Bay Research Center may also be collecting data in this region, but they don't have an active website at this time.

Damariscotta River Estuary - The Damariscotta River Association collects information about water quality and shellfish habitat. Much of the research done at the Darling Marine Center takes place in this region.

Casco Bay - More than 100 volunteers each year help collect critical baseline data at more than 80 shore-based stations and assist FOCB staff at another ten profile stations located throughout Casco Bay. They collect baseline data on salinity, dissolved oxygen, temperature, pH, and water clarity. The Casco Bay Estuary Partnership also compiles publications about relevant issues (e.g., stormwater, toxics, habitat conservation).

Publications that characterize the coast:
Two pre-GIS era publications provide comprehensive overviews and detailed summaries of available information for specific coastal regions. The Ecological Characterization of Coastal Maine (1980) presents a compendium of available information for certain bays. Though not all embayments are included in this publication and information on many of the areas covered was incomplete at the time, it serves as a synthesis that provided a base for many years. A second example is the Estuarine Profile Series (1991) that provides descriptive information for 19 estuaries along the Maine coast. Though brief, the profiles provide background information that highlight features these water bodies and surrounding populated areas.

In addition to these location-specific publications there are a number of other reports than can serve as a general resource for coastal areas. These include Maine's Coastal Wetlands by Alison E. Ward. GIS was used extensively for generating maps and summarizing habitat type information for coastal regions. Another example is the Distribution and Abundance of Fishes and Invertebrates in North Atlantic Estuaries by S. H. Jury and others (1994). For most embayments these can serve as general guides to habitats and biota but do not provide embayment specific detail that often is required for good management decisions.

Current Status of Marine GIS in Maine
Three GIS needs assessments have been completed in Maine over the last 18 months. The Department of Marine Resources report, "Maine Marine GIS Needs Assessment" focused on the status of marine GIS at the State level. It asserts that marine-focused organizations have unique needs that are not being addressed by current land-focused GIS initiatives. More specifically, 12 of the 17 bottlenecks to better implementation of marine GIS in Maine are related to lack of needed data (and metadata). Furthermore, there has been no coordinated, comprehensive effort among organizations that work in the marine environment to share data, and many smaller organizations are not aware of what data is available. See the appendix for more detailed results and recommendations from the "Maine Marine GIS Needs Assessment."

The Maine Coast Protection Initiative (MCPI) report, "Geographic Information System Needs Assessment: Survey Results for Coastal Land Trusts in Maine," found that while most coastal land trusts collect geospatial data and make regular use of GIS for map production, a vast majority need capacity building to make more effective use of GIS (more than 50% of those responding (26 organizations) had dial-up internet connections!). In addition, there are a number of important spatial data needs including digital parcel data, aerial and satellite imagery, priority habitat areas, and public access locations. MCPI is funding three GIS resource centers for coastal land trusts: University of Maine, Machias (new center), Wells Reserve (existing), and Sheepscot Valley Conservation Association (existing). These centers will provide trainings to both seasoned and new GIS users, offer no- or low-fee mapping services, and provide a data bundle and ArcReader so all land trusts can access information via basic GIS. MCPI funds are specifically to help land trusts, but these centers (especially Wells and Sheepscot) may also provide assistance to others (municipalities, conservation organizations).

The Maine Library of Geographic Information (Maine GeoLibrary) report, "GIS Needs Assessment & Requirements Analysis For Maine County Government" was based on a series of workshops with county, state, regional planning agency, and municipal officials from June 2005

until January 2006. They found that regionalization of data services is an important goal and that county offices could serve as regional GIS centers, although current staffing levels and technical knowledge would need to be increased to do so.

In addition to the information provided by these broad GIS needs assessment, two bay management pilot projects carried out GIS exercises that highlight the opportunities and limitations of GIS to assist with bay management initiatives. Both groups emphasized that GIS capabilities and the maps produced were essential for their efforts. Visualization of spatial information was pivotal in discussions during the respective studies. However, several specific major limitations arose:

a. Several pivotal marine GIS layers are lacking (e.g. human use; habitat maps) and much of the ecological and social data that does exist is not available at the bay level (i.e. it is at a very site specific scale or much larger coastal or Gulf of Maine scale). Local groups cannot possibly collect all the needed information.
b. GIS maps were one of the most prized outcomes of the projects and yet took relatively more effort than any other component. Identifying and assembling the proper data layers takes a fair amount of expertise and good hardware and software. This is beyond the capabilities of most local entities. Both pilot projects had outside GIS experts help them, which might not be available everywhere.

The Muscongus Bay pilot study provided eight recommendations highlighting the need for more and better data and documentation. An overriding need expressed by QLF was for centralized data storage and distribution on the part of State government. The following are QLF observations and recommendations:

- Paucity of readily available GIS data for the marine environment.
- Creating seamless data sets across the land/sea interface.
- Paucity of fine-scale, or bay-scale GIS data.
- Primary data gathering is essential for generating detailed human use data appropriate for bay management, but it takes time.
- Absence of regional data on coastal development.
- Sensitivity of data sets.
- Lack of documentation for non-OGIS data sets.
- Aggregating data on the final maps.

Data Exchange: Storage, Sharing and Accessibility of Data and Information

Even without doing a complete data inventory (which would undoubtedly uncover additional locations of data), we identified 8 federal agencies, 8 state agencies, at least 6 university research centers (some of which are located out-of-state), 13 organizations (e.g. GOMOOS, GMRI, Island Institute, etc.), and at least 200 local groups and municipalities (a GOMC search came up with over 200 local research and monitoring organizations in Maine such as Friends of Casco Bay and Damariscotta River Association) that collect data about Maine's nearshore and marine environment. At the same time, no entity attempts to compile a catalogue of where to find data about the nearshore. A few state agency websites have links to available data, but those links to data are rarely all in one place and data can be very difficult to track down. It is even more difficult to learn about what data exists outside of federal and state government.

A recent NOAA study (Bricker et al 2006) that examined eutrophication of coastal waters also concluded that "Acquiring data was the most difficult part of this study and inadequate data was a limiting factor. Data were found in a number of places and had to be retrieved from a number of investigators; other forms of data collection proved unsatisfactory. Inadequate data was a limiting factor for both the eutrophication assessment and the development of the human-use indicator." Thus, even a well-funded study looking for limited data (only water quality) found it extremely difficult to locate needed data.

Information transfer can be accomplished in a variety of ways and for many purposes. There can be a physical place such as an office or library or a virtual space such as a website. The internet has augmented many traditional methods by allowing electronic access, searching (discovery), and delivery information to meet a range of needs. Some examples include: Email listservs (issue specific emails); RSS feeds (really simple syndication - organized by topic and source); and Websites and portals. The GOMOOS site serves an example of a website geared to assist with information access and distribution. It provides regional (Gulf of Maine) near-real time data and a data archive that can be accessed for a range of parameters. Data is displayed in both map and table formats. On the national level, the NASA Global Change Master Directory, a comprehensive directory earth science data and applications, serves as an example of collaboratively maintained, data discovery portal that can function at any scale. The Maine Office of GIS provides a more traditional data catalogue that can be searched based on key words. However, at present, few if any formats provide adequate access to the range of information needed for even the simplest bay management applications.

SECTION 2: FINDINGS

Data Availability

- There are major gaps in basic nearshore data. There are many types of data about the nearshore that do not currently exist, as well as many existing data sources that are out-dated or at the wrong scale to be useful. A few of the major data acquisition priorities include: nearshore habitat mapping; human use mapping (what, where, when, how much); distribution of most species; cumulative impacts; species interactions/ecology; and land use impacts on nearshore water quality and habitats. For a list of the most needed marine GIS data sets, see the Marine GIS Needs Assessment recommendations in the appendix.

- Available nearshore data are scattered in topic and geographic area of focus. The agencies and organizations that collect and manage marine data differ in many ways. Regulatory agencies collect different data than do management agencies, and government agencies in general are limited to collecting data related to their missions and funding sources, which may not be relevant to those outside of government. Agencies and organizations have wide ranging geographical foci and scales of interest, collecting data about very specific places, a bay, the entire coast, a particular watershed or even the Gulf of Maine. The different priorities for type and scale of data collected results in a compendium of unrelated or disconnected data. For example, data about coastal land is often not compatible or analyzed in conjunction with data about nearshore waters. Furthermore, agencies and organizations involved in nearshore issues have different and sometimes contradictory research priorities. A more complete understanding of nearshore environments could be enhanced by working to develop a common list of priority data and research needs.

Data Exchange

- It is extremely difficult to find and gather existing data. State and Federal government websites are generally inadequate in making data available; not only is there no central place on their websites to access data, but their search engines are limited, often returning large numbers of unrelated hits to a query. Non-governmental organizations are scattered, and some do not have the capacity to make data easily available to others. Furthermore, all entities can be reluctant to share data for several reasons: desire for ownership or credit, fear that data might be misused or misinterpreted, belief that data is confidential or sensitive, or knowledge that the data collection or analysis is still in progress.

- It is helpful that so many types of organizations are creating data, but this situation calls for careful documentation (i.e. creation of metadata or clear methods) and sharing of data. There is no self-identified group focused on compiling or creating data exchange agreements for nearshore data.

- While larger organizations (state agencies and large non-profits) in Maine are well set up for internet communications including data transfer, many local organizations still use dial-up connections or use older hardware and software. Efforts to improve data exchange need to consider such technological limitations.

Marine GIS

- Marine GIS as it currently stands in Maine is limited in its ability to assist with understanding nearshore environments and to assist with decision making. GIS data acquisition in Maine has been dominated by land-side data and issues. There has been no concerted effort on the part of marine-focused organizations to create a more comprehensive marine GIS.

- The Maine Marine GIS Needs Assessment found the following impediments to GIS data exchange and implementation, most of which are probably relevant to non-spatial data as well: data problems (inaccurate/out-of-date, inconsistent formats, no metadata), data exchange (hard to find data, assistance needed to view/analyze data), and priorities (tight funding, politics of data access/not sharing, lack of coordination).

- The MEGIS online data catalog and web viewer http://apollo.ogis.state.me.us/catalog/ is the main way that state agencies make their GIS data sets available to other organizations and the public. The Maine Marine GIS Needs Assessment found that while the most used web site is MEGIS, but only about ½ of the organizations report using it. Furthermore, data not on MEGIS are very difficult to discover.

General

- Scientific inquiry will rarely produce definitive answers. For this reason, science is not likely to reduce debate and contention in nearshore management, especially when human values are at stake. Science can provide data and information to be used to help define a range of options, but must be paired with good decision-making processes and policies to be useful in any bay management endeavor.

SECTION 3: RECOMMENDATIONS

Recommendation 1: Create a Long-Term Coastal Marine Science Plan

The Department of Marine Resources should lead an initiative to bring together representatives from DEP, DMR, MGS, SPO, IFW, DOC, municipalities and NGOs who work in the marine environment to develop a long-term plan for coastal marine science. This will help fill the identified gap in availability of data and information. The plan would consist of several components, each listed as a separate task below.

Task 1: Conduct sector-specific research and monitoring needs assessments

The goal of this assessment is to identify and prioritize top research and monitoring needs that address nearshore coastal management. The assessment will incorporate needs from various marine and nearshore entities (state and local governments, industry, non-profits). The research and monitoring needs assessment will put Maine in a positive position to seek funding through grants, programs, and partnerships. More importantly, though, it will guide policy makers and program managers by identifying real needs in the context of all.

Timeline – 1 year

Cost ~ 1 FTE equivalent or $50,000

Task 2: Develop a human use and resource atlas

Coastal and bay management suffers from lack of information on the location and condition of coastal resources as well as the location and pressure of their use. This atlas will be GIS-based and dynamic. Information will be compiled from various sources and incorporate both quantitative and local knowledge. It will be useful in setting priorities and identifying ecological relationships, especially between habitat requirements and species and their vulnerability to human exploitation. Once the base atlas has been developed, it can be periodically updated as new data from the larger coastal monitoring program is gathered.

Timeline – 5 year

Cost ~ 1 FTE - $60,000/yr

Task 3: Compile a baseline inventory

There is much information that has already been collected but neither compiled nor digitized that can help decision makers assess changing conditions in our coastal systems. For example, the Maine State Archives contains Critical Areas Program files that characterize intertidal benthic communities along the entire coast. These are in paper form and not easily accessible. Older data need to be made available digitally. Funding must be made available to prioritize, catalogue and digitize earlier publications and data sets so that the information contained is accessible for use by resource managers and scientists.

Timeline – 1 year

Cost ~ 1 FTE - $60,000

Task 4 – Establish Long-term Monitoring Stations

Distinguishing natural variability from that caused by humans is important. Trying to manage natural events is futile and resources are better spent on managing those impacts that are truly manageable. Long-term monitoring, although not glamorous, is essential in creating long time

series that documents the ebbs and flows of nature. A network of index stations would monitor changes in living resources and physical and chemical parameters of sediments and water.
Timeline – Ongoing
Cost ~ $200,000/yr. (multi-agency and NGO partnership)

Task 5 – Re-establish a state marine research funding program
In the late 1980s, the Legislature established a marine research fund to support the research and monitoring plan of the Maine Marine Research Board. The fund was not well known and rarely used. This new fund would be dedicated to funding coastal marine research and monitoring, and would be supplied with money from voluntary consent agreements, and donations from natural resource damage assessments, non-government contributors including commercial and recreational marine industries and conservation NGOs. Dispersements would be used to address the sector based needs identified in Task 1.
Timeline – ongoing
Cost - $0

Recommendation 2: Engage in an Information Exchange Initiative
The Maine State Planning Office should lead an initiative to identify information exchange needs and develop delivery and exchange mechanisms that will provide wide access to coastal marine data. The initiative would consist of the following components:

Task 1: Identify an information technology (IT) based data distribution method and train users
A careful study and analysis must be carried out to determine the most cost effective means to distribute information via the web to local and regional entities. There is a wide range of IT options available but dollars will be needlessly spent if the target audience is not able to take advantage of new resources. Key investments in hardware, software, and training must be made at the regional level.
Timeline – 2yr
Cost ~ $100,000/yr

Task 2: Develop data standards and metadata
To make data exchange most useful, data needs to be created with common standards and associated with good documentation or metadata. Data standards such as those developed by the Maine Geolibrary for parcel data will need to be established for all types of data sets and FGDC compliant metadata should accompany all GIS data sets.
Timeline – 2yr
Cost ~ 1 FTE - $60,000/yr

Task 3: Develop a bay management information portal
Develop a portal similar to that used by Chesapeake Bay Program (http://www.chesapeakebay.net/) to provide access to the best available information and to foster communication among those with interested in bay management. The portal should provide simple tools for data and information access, as well as background and updates on regional bay management initiatives. It should be integrated with InforME (http://www.maine.gov/informe/) and also take advantage

of new, innovative regional and national information technology such as those being explored by the Gulf of Maine Ocean Data Partnership.
Timeline – 3yr
Cost ~ $100,000/yr

Maine Marine Geographic Information System

Recommendation 3: Create a Robust Marine GIS in Maine
Maine Department of Marine Resources should take a leadership role in coordinating and advocating better marine GIS throughout Maine and the Gulf of Maine. The Marine GIS Needs Assessment suggested that most needs identified would benefit from better coordination and planning at the state level, through DMR, and that the Maine GeoLibrary and MEGIS could offer the organizational structure to fully integrate marine GIS with other GIS activities in the state.

Task 1 – Engage in a focused effort to develop marine GIS data layers, standards and exchange
Marine GIS lags behind land-based GIS in terms of standards and available data. Marine GIS has standards different than those developed for land-based GIS data. Only through a concerted and specific focus will Maine be able to develop marine GIS robust enough to aid in coastal understanding and decision making. Furthermore, there is not enough ecological or social data at a bay level to manage intelligently. In order for bay management regional initiatives to be successful, the State must help by collecting and compiling marine GIS in a way that enables bay level organization of data, when relevant. Additional GIS staff based at DMR would be needed to manage and coordinate this effort. As data are developed, this marine GIS could be integrated into the MEGIS and the GeoLibrary so that it is easily accessible to others. The State should develop Web Mapping Services such as ArcIMS applications or other OpenGIS services that can be used in support of marine GIS.
Timeline – 3 yrs
Cost ~ $150,000/yr

Task 2 – Provide support to existing regional resource centers
Two GIS needs assessments and both bay management pilot projects pointed to the need to have regional GIS resource centers to support regional initiatives. Most local groups do not have the capacity and knowledge to find and analyze data on their own, but presently State staff cannot dedicate the time needed to help individual groups. A regional community GIS center is one way to provide this link. The MCPI has provided trial support to three such regional centers, and the Applied Geographics County Needs Assessment suggested using county government offices for such centers (although no work has begun on this yet). The state should evaluate the effectiveness of and provide additional support (training, funding, data) to the pre-existing regional resource centers most likely to be able to assist regional bay management initiatives. If a gap exists along the coast (e.g., Frenchman's Bay area), the State could look to supporting an existing group to could become a resource center. The State will never be able to manage at fine scales without local capacity. Supporting resource centers will build local capacity and will equally benefit State resource managers as it does regional centers.
Timeline – Ongoing
Cost - $150,000/yr

ACRONYMS

BPL - Maine Bureau of Parks and Lands (in Department of Conservation)
BwH - Beginning with Habitat (program of IFW)
CMGE – Coastal Marine Geologic Environment (data layer maintained by MGS)
COA – College of the Atlantic (in Bar Harbor, ME)
DEP – Maine Department of Environmental Protection
DMR – Maine Department of Marine Resources
DOT – Maine Department of Transportation
EPA – US Environmental Protection Agency
GIS – Geographic Information System
GMRI – Gulf of Maine Research Institute (in Portland, ME)
GOM – Gulf of Maine
GOMC – Gulf of Maine Council on the Marine Environment
GoMOOS – Gulf of Maine Ocean Observing System
IFW - Maine Department of Inland Fisheries and Wildlife
MASKGI – Maine Association of Sea Kayak Guides and Instructors
MCHT – Maine Coast Heritage Trust
MCPI – Maine Coast Protection Initiative (MCHT, SPO, NOAA and Land Trust Alliance)
MEGIS – Maine Office of GIS
MERI – Maine Environmental Research Institute (in Blue Hill)
MGS – Maine Geologic Survey
MITA – Maine Island Trail Association
NASA – National Aeronautics and Space Administration
NMFS – National Marine Fisheries Service
NOAA – National Oceanic and Atmospheric Administration
NOS – National Ocean Service (part of NOAA)
NPS – National Park Service
NWR – National Wildlife Reserve (administered by USFWS)
OBD – Overboard Discharge
QLF – Quebec-Labrador Foundation
SPO – Maine State Planning Office
SVCA – Sheepscot Valley Conservation Association
TNC – The Nature Conservancy
UMO – University of Maine
UNH – University of New Hampshire
USGS – US Geological Survey
USFWS – US Fish and Wildlife Service

REFERENCES

Applied Geographics. 2006. GIS Needs Assessment & Requirements Analysis For Maine County Government. Prepared for the Maine Library of Geographic Information. http://apollo.ogis.state.me.us/sc/final/default.htm

Applied Geographics and Northern Geomantics. 2006. Maine Marine GIS Needs Assessment. Prepared for the Maine Department of Marine Resources. http://www.maine.gov/dmr/baystudy/science/index.htm

Atkinson, J, Ed. 2006. The Muscongus Bay Pilot Project. Quebec-Labrador Foundation.

Ecosystem Modeling in Cobscook Bay, Maine: A Boreal, Macrotidal Estuary. Larsen, P. F., Ed. 2004. Northeastern Naturalist, Volume 11, Special Issue 2.

Fefer, S.I. and P.A. Schettig, Eds. 1980. An Ecological Characterization of Coastal Maine (North and East of Cape Elizabeth), US Fish and Wildlife Service, Northeast Region, Newton Corner, MA. FWS/OBS-80-29

Fisheries and Oceans Canada. 2002. Canada's Oceans Strategy: Policy and Operational Framework for Integrated Management of Estuarine, Coastal and Marine Environments in Canada.

Jury, S.H. et al. 1994. Distribution and Abundance of Fishes and Invertebrates in North Atlantic Estuaries. ELMR Report No. 13, NOAA?NOS SEA Division, Silver Spring, MD.

Maine Coast Protection Initiative. 2005. Geographic Information System Needs Assessment: Survey Results for Coastal Land Trusts in Maine. http://www.protectcoastalmaine.org/Grants/MCPI%20GIS%20Needs%20Assessment%20Report.pdf

Maine Coastal Program. 1991. The Estuary Book. Maine State Planning Office.

Maine Coastal Program. 1991. Estuary Profile Series. Maine State Planning Office.

Massachusetts Ocean Management Task Force. 2004. Waves of Change. http://www.mass.gov/czm/oceanmanagement/waves_of_change/index.htm

Mayer, L.M. et al., 1996. The Kennebec, Sheepscot and Damariscotta River Estuaries: Seasonal Oceanographic Data. Univ. Maine, Dept. Oceanography Tech. Rept. No. 9601, 110 pp.

Perrin, S, Ed. 2006. The Taunton Bay Pilot Project. Friends of Taunton Bay.

Quebec-Labrador Foundation. Unpublished report on Marine Area Characterizations.

Pesch, G.G. and Wells, P.G., Eds. 2004. Tides of Change Across the Gulf: An Environmental Report on the Gulf of Maine and Bay of Fundy. GOMCME

S. Bricker, D. Lipton, A. Mason, M. Dionne, D. Keeley, C. Krahforst, J. Latimer, J. Pennock. 2006. Improving Methods and Indicators for Evaluating Coastal Water Eutrophication: A Pilot Study in the Gulf of Maine. NOAA Technical Memorandum NOS NCCOS 20. National Ocean Service. http://www.ccma.nos.noaa.gov/publications/TMNCCOS20.pdf

State of the Bay 2005. Casco Bay Estuary Partnership. www.cascobayestuary.org.

Tyrrell, M.C. 2005. Gulf of Maine Marine Habitat Primer. Gulf of Maine Council on the Marine Environment, http://www.gulfofmaine.org/habitatprimer/default.asp.

Ward, A.E. 1999. Maine's Coastal Wetlands: Types, Distribution, Rankings, Functions and Values. Maine Department of Environmental Protection. http://www.state.me.us/dep/blwq/doccoast/coastal3.htm.

APPENDIX

- Maine Marine GIS Needs Assessment
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